

## CLEANUP PROCESS

### STEP 1

Is a site a threat to human health and the environment?

### STEP 2

#### **Remedial Investigation**

- (a) Characterize the magnitude and extent of contamination (see WAC 173-340-350 for detail on required elements).
- (b) Evaluate all exposure pathways and select relevant pathways (see WAC 173-340-350 and 173-340-700 through 760).
- (c) Identify site indicator chemicals (see WAC 173-340-708).
- (d) Identify cleanup levels for each media. Determine the appropriate cleanup level for each media based on protection of both human health and the environment. These are based on Method A, B, or C (see WAC 173-340-700 through 760).
- (e) Compare site concentrations to cleanup levels for both human health and the environment. Method A cleanup levels shall not be used for this comparison unless the site meets the criteria for use of Method A in WAC 173-340-704(1). For those chemicals, media and pathways where the concentrations are less than the cleanup levels, no further cleanup is required at the site. If concentrations are above cleanup levels, it is necessary to evaluate and select a remedial action. This may include a combination of: treatment technologies, engineered controls and institutional controls.

### STEP 3

Identify and conduct **interim actions** if needed.

### STEP 4

Identify cleanup action **components** that may be appropriate for the site from the following list:

- 1. Reuse or recycling
- 2. Destruction or detoxification
- 3. Immobilization or solidification
- 4. On-site or off-site disposal at an engineered, lined and monitored facility
- 5. On-site isolation or containment with engineered controls
- 6. Institutional Controls

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### STEP 5

Develop cleanup action alternatives by identifying which cleanup action component(s) can be combined to form an alternative(s) and which cleanup action components should be evaluated as a stand-alone alternative(s). The number and types of alternatives to be evaluated shall take into account the characteristics and complexity of the facility and may include an initial screening to reduce the number of potential remedies for the final detailed evaluation.

Only **reasonable alternatives** should be analyzed in the feasibility study. That is, only alternatives which may be appropriate for achieving the requirements of protectiveness, permanent to the maximum extent practicable, implementability, etc. shall be evaluated in detail. The goal is to eliminate options clearly unsuitable for the site without excessive study.

Include a permanent solution (Items 1, 2 or 3 from step 4) that appears to be the most practicable permanent solution for the site, except where noted below. A permanent solution will not be required for: landfills or other sites where a model remedy exists, sites where a permanent solution is not technically possible, or the costs are so clearly disproportionate that a more detailed analyses is not necessary. Include more than one permanent solution if appropriate.

It is during this step that remediation levels and alternate points of compliance can be considered. Alternatives may include the same combination of cleanup action components, but with different remediation levels. Remediation levels may be determined by using qualitative and quantitative methodologies

### STEP 6

Evaluate each cleanup alternative according to the criteria below. The results of a quantitative risk assessment may be used as part of the evaluation, particularly for criteria 1,2,3 and 4. For alternatives that include any institutional control as a component; the institutional control(s), as well as the other components, must be evaluated. Evaluation shall include both quantitative and qualitative elements and shall be commensurate with the level of detail needed to make decisions at a site. Alternatives evaluated at a site shall have information organized in such a way that one alternative can be easily compared to another.

- (a) **Protection** of human health and the environment. Evaluate the degree of protection of human health and the environment including the:
  - (i) Magnitude of risk remaining after remediation including the characteristics and quantity of any treatment residues generated;
  - (ii) Degree to which existing risks are reduced;
  - (iii) Time required to reduce risk at the facility and attain cleanup levels;  
Restoration time frames shall be established by considering the factors in WAC 173-340-366.
  - (iv) Degree of certainty that the alternative will be successfully implemented;  
and
  - (v) Improvement of the overall environmental quality.

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- (b) **Degree of permanence.** Evaluate the degree of permanence including:
  - (i) Degree of reduction of toxicity, mobility, and volume;
  - (ii) Reduction or elimination of hazardous substance releases and sources of releases;
  - (iii) Degree of irreversibility of the waste treatment process; and
  - (iv) Characteristics and quantity of treatment residuals generated.
- (c) **Long-term effectiveness.** Evaluate whether the alternative will be effective as long as hazardous substances above the cleanup levels remain on-site; including:
  - (i) Level and type of long-term effort required by the PLP, Ecology or other parties to ensure that human health and the environment are protected and the degree of certainty that that will occur;
  - (ii) Mechanisms that will be used to ensure long-term effectiveness of a non-permanent remedy; and
  - (iii) Consequences of failure of the alternative.
- (d) **Short-term effectiveness.** Evaluate whether short term risks can be managed including:
  - (i) Protection of human health and the environment during construction and implementation of the alternative, and
  - (ii) Degree of risk to human health and the environment prior to attainment of cleanup standards.
- (e) **Implementation.** Evaluate the relative ease of implementation including:
  - (i) Consideration of whether the alternative is technically possible;
  - (ii) Availability of necessary off-site facilities, services and materials;
  - (iii) Administrative and regulatory requirements;
  - (iv) Scheduling;
  - (v) Size;
  - (vi) Complexity;
  - (vii) Monitoring requirements;
  - (viii) Access for construction, operations and monitoring; and
  - (ix) Integration with existing facility operations and other current or potential remedial actions.
- (f) **Costs.**
  - (i) Estimate the costs of each alternative including: administrative and engineered costs of construction and the net present value of any long-term costs. Long-term costs include, but are not limited to: operation and maintenance, monitoring, equipment replacement, and Ecology's costs which are cost-recoverable. Costs which are common to all alternatives shall be included in the disproportionate cost test. Cost estimates for a treatment technology shall describe whether pretreatment, analytical,

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labor, residual waste management costs, and other costs are included in a cost per volume or weight estimate. Cost of an alternative may include elements which are not quantifiable. These shall be evaluated qualitatively.

- (ii) For non-permanent remedies, the design life of the remedy shall be estimated and the cost of replacement or repair of major elements shall be included in the cost estimate for that alternative.

(g) **Community concerns.** Evaluate the degree to which community concerns are addressed particularly:

- (i) Methods of identifying the public's concerns; and
- (ii) Methods of addressing the public's concerns.

### **STEP 7**

Rank the alternatives based on the relative degree to which they meet the criteria "degree of permanence."

### **STEP 8**

Disproportionate cost test. To select the remedy and determine which alternative is "permanent to the maximum extent practicable", compare each alternative to all the other alternatives. Work in a step-wise from the most permanent remedy to the least permanent alternative comparing each alternative with the alternatives that are less permanent.

The cost of an alternative is disproportionate if the incremental cost of the alternative over that of a lower cost alternative exceeds the incremental degree of benefits (Criteria 1-6) achieved by the alternative over that of the lower cost alternative.

### **STEP 9**

Write the draft cleanup action plan and conduct public participation on the plan.

### **STEP 10**

Issue the final cleanup action plan and conduct the cleanup action.

### **STEP 11**

Conduct compliance monitoring as appropriate.

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### NOTES:

The following **shall be followed** when developing reasonable alternatives, conducting the disproportionate cost test and selecting the remedy:

- Institutional controls (e.g. deed restrictions) shall be required to assure both the continued protection of human health and the environment and the integrity of an interim action or cleanup action in the following circumstances:
  - 1) The cleanup standard is established using method A and hazardous substances remain at the site at concentrations which exceed method A cleanup levels;
  - 2) The cleanup standard is established using method B and hazardous substances remain at the site at concentrations which exceed the method B cleanup levels;
  - 3) The cleanup standard is established using method C;
  - 4) A conditional point of compliance has been established as the basis for measuring compliance at the site;
  - 5) The cleanup action is based on the assumption of land use other than residential such as industrial or commercial land use or other land uses;
  - 6) The cleanup action requires resource use restrictions such as limitations on the use of ground water or restrictions on shellfish harvesting or fishing;
  - 7) The cleanup action includes the use of engineered controls; or
  - 8) The department determines such controls are required to assure the continued protection of human health and the environment or the integrity of the cleanup action.
- The selected cleanup action shall return useable ground waters to their beneficial uses wherever practicable, within a reasonable time frame. Where ground water treatment to achieve the cleanup levels is not practicable the measures in WAC 173-340-36\_\_ (Ground water restoration section) shall be taken. Those measures include: treatment to the maximum extent practicable; containment to avoid additional migration to the maximum extent practicable; source control to prevent or minimize additional releases; monitoring; alternative water supply; periodic review; institutional controls.
- The selected cleanup action shall provide for a reasonable restoration timeframe. The factors to consider when establishing a reasonable restoration timeframe include: potential risks, practicability of achieving a shorter timeframe, current use of the site and associated resources, potential future use of the site and associated resources, availability of alternative water supplies, effectiveness and reliability of institutional controls, ability to control and monitor migration, toxicity of hazardous substances at the site, natural processes which reduce concentrations of hazardous substances.  
*There is additional restoration timeframe language that is not included here.*

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The following **should in most cases** be followed when developing reasonable alternatives, conducting the disproportionate cost test and selecting the remedy:

- The selected cleanup action should not result in a significantly greater overall threat to human health and the environment than other alternatives.
- The cleanup action should prevent or minimize additional releases of hazardous substances (high hurdle for not doing this).
- The cleanup action should not rely primarily on dilution, dispersion, and institutional controls/monitoring (high hurdle for relying primarily on these).

The following **should** be considered when developing reasonable alternatives, conducting the disproportionate cost test and selecting the remedy:

- Treatment should be used wherever practicable. Use of treatment technologies should be emphasized at sites containing liquid wastes, areas contaminated with high concentrations of hazardous substances, highly mobile materials and/or discrete areas of hazardous substances.
- To minimize the need for long-term management of contaminated materials, material at sites with small volumes of hazardous substances should be totally destroyed, detoxified and/or removed.
- Containment will often be appropriate at sites or portions of sites that contain large volumes of materials with relatively low levels of hazardous substances where treatment is impracticable.
- Active measures should be taken to prevent precipitation and subsequent runoff from coming into contact with contaminated soils and waste materials. When such measures are impracticable, such as during active cleanup, runoff should be contained and treated prior to release for the site.
- For facilities adjacent to a surface water body, active measures should be taken to prevent or minimize releases to surface water via surface water runoff and ground water discharges.
- For facilities where hazardous substances remain on-site at concentrations exceeding the cleanup levels, those hazardous substances should be consolidated to the maximum extent practicable where needed to minimize potential for direct contact and migration.